

THE FUTURE OF UBIQUITOUS ELEARNING

Timothy Arndt

Dept. of Computer and Information Science - Cleveland State University, Cleveland, OH, USA

ABSTRACT

Post-secondary students are increasingly receiving instruction by eLearning. Many of these are part-time students or are working while taking classes. In such circumstances, students may find themselves short of time to study. One mechanism that can be exploited to make the best use of available time is ubiquitous eLearning. Ubiquitous eLearning can take place at any place, at any time and is enabled by mobile computing devices such as laptops, tablets, and especially smart phones. In this poster paper, we present our initial thoughts on how sensor-filled mobile computing devices will enable ubiquitous eLearning. We also will present in the poster the results of our latest experimentations, which will be carried out in January and February 2014 on the modeling and prototyping of ubiquitous eLearning environments.

KEYWORDS

Ubiquitous learning , mobile learning, collaborative learning.

1. INTRODUCTION

Ubiquitous computing (sometimes called pervasive computing) creates ambient intelligence where environmentally embedded devices provide continuous, unobtrusive and reliable connectivity and computation while performing value added services [9, 10]. Ubiquitous computing implies an ability to adapt to environmental conditions, which are determined by sensors [1, 7]. Several experimental systems have recently been described which apply ubiquitous computing to the e-learning application [2, 3, 4]. Other researchers have described the challenges in adapting learning material to the ubiquitous learning environment [5, 6, 8]. These approaches often target primary and secondary learners. Our research is oriented towards post-secondary, working or part-time students who have a limited amount of time to devote to their studies. Many of our students fit in this category. They may need to fit their studying into slack times such as: commuting; between appointments; while on vacation; etc.

2. APPROACH

In our approach to ubiquitous e-Learning, the learning materials must be optimized to run on mobile computing devices such as smart phones and tablets. However, our approach goes beyond this. Given the non-conventional study environment, our students may face a number of different obstacles to effective learning: noise; motion; low light conditions; etc. Such obstacles can lessen the students' concentration. Students also may have different amounts of time available for them to study. These conditions and more make up the students' **ubiquitous learning environment**. The students' computing platform must not only present the materials to them, but to add the most value, it must perform situational identification [9] in order to present relevant and timely learning materials. Such situational identification relies on learner profiles [4, 5, 8] which are commonly used in e-Learning, but also on the use of sensors [7], to determine the situation the learner finds himself in, and to present the most appropriate material. Smart phones and tablets which are commonly used devices by today's students contain a variety of sensors which could be exploited for situation identification. Table 1 lists the sensors in the iPhone 5. In addition, of course, there are built-in camera, microphone, GPS, etc. Ambient lighting and noise, motion detectors, etc. can be used to determine that a student's environment is best suited for easier material, rather than more rigorous material. Such a determination requires **sensor fusion**. This information can be combined with information from the learner profile to determine, for example, that the student is currently in a commuting experience and has a certain

amount of time, say 30 minutes, available for study. This can determine an appropriate chunk of learning material to present to the students. This requires a more general **information fusion** process. Learning materials need to be classified as to length, difficulty, and ordering, following standards, where they exist. As a further example, the camera can be used to sense by a student's facial expression that he is puzzled by the current material, and hence a review session should be triggered.

Table 1. iPhone 5 built-in sensors

Sensor	Use
Proximity sensor	Senses when display is close to face
Ambient light sensor	Can be used to adjust brightness of display
Accelerometer	Can be used to change screen orientation and for games
Magnetometer	Measure strength and/or direction of magnetic field
Gyroscopic sensor	Increases motion perception

3. FUTURE RESEARCH

We are currently developing a model of ubiquitous learning based on concepts such as sensors, learning profile, learning community (via social network technology), situation definition, sensor fusion, and information fusion. This model is being used to develop a prototype ubiquitous eLearning system. Both the model and prototype system incorporate our previous research in eLearning [11, 12] and will be presented in the poster.

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